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AUTHOR Valtin, Renate
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ABSTRACT

A review of German research studies on dyslexia since 1970 found 70 studies that were either empirical investigations or new theoretical perspectives on already existing data. These studies were then classified according to whether they were explicitly or implicitly related to educational procedures and according to their inherent assumptions about the nature of reading disability and reading or spelling programs. Studies with implicit educational value were again classified according to how they identified characteristics of poor readers or spellers: causal factors, deficits in psychomotor or cognitive domains, characteristic symptoms in reading or spelling (eye movements and errors), and partial deficit processes. Studies with explicit educational value were divided according to their psychological interventions (cognitive, psychomotor, psychotherapeutic, muscle relaxation, autogenes) and according to their specific program (cognitive, linguistic, comprehensive, prevention, remedial). Studies reviewed revealed some of the following: (1) training effect was independent of the IQ of the children; (2) despite 2 years of remedial education in the elementary school, 20% to 30% of the children still had severe spelling problems; (3) many children were able to overcome their dyslexia through specific instruction and without psychotherapeutic interventions; and (4) programs that were specifically designed to meet individual needs were more effective than comprehensive programs. (HOD)

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Renate Valtin
Freie Universität Berlin

STUDIES OF DYSLEXIA: IMPLICATIONS FOR EDUCATION

Invited Paper presented at
The Ninth World Congress of Reading
Dublin, Ireland, July 1982

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In my paper I will give a review on research studies on dyslexia and their implications for educational practice in Germany.

My question is: What does research in this field tell us about what to do with dyslectic children in respect to remedial procedures, in regard to more general principles and specific measures of remedial teaching.

My analysis is concentrated on German research, not only for time reasons but also because one might argue that results of research studies of countries with other languages are not directly transferable to the German language with its specific linguistic structure. This review includes studies since about 1970, because most of the empirical research on dyslexia began at that time.

One word to my search strategies in sampling the field: I tried to gather all German books and articles that were listed in educational and psychological bibliographies and went through all German education and psychology journals covering the last three years because these articles are not yet included in bibliographies. This literature is very extensive, but if all books and articles that repeat already existing ideas are eliminated, only about 70 studies remain, which are based on empirical data or use empirical data to interpret it in a new theoretical perspective. To summarize, I try to include all German studies on dyslexia since 1970 that are either empirical investigations or that bring a new theoretical perspective to interpret already existing data. Studies with a sample of six or less dyslexic children were not included (Heller 1978, Schmidtchen et. al. 1973).

One principal problem in presenting these studies is that the term "Lagastenie" is not used in a constistent way by all researchers. The concept of "Legastenie" is a purely formal one and each researcher can more or less arbitrarily choose his/her operational definition and the criteria concerning the degree of reading retardation and the measure of

intelligence. In Germany this issue becomes even more complicated by the fact that most researchers use spelling tests, or in some instances a combination of reading and spelling tests, as a diagnostic tool for dyslexia.
Another problem in writing this review was how to classify and order the research studies. I chose two criteria for classification:

- is the study implicitly or explicitly related to educational procedures?
- what are the inherent assumptions of these studies concerning the nature of the reading disability and the process of reading and spelling?

Studies with explicit educational value are training studies with an experimental design that yield hints whether certain remedial procedures are useful or not.
Studies with implicit educational value are those that try to identify characteristics of poor readers/spellers and draw a conclusion for educational procedures. These studies again may be classified according to their aim. They try to identify:

- causal factors
- deficits in psychomotor or cognitive domains
- characteristic symptoms in reading and/or spelling
- partial processes that are disturbed in poor readers and/or spellers.

I Studies with implicit educational value

1. Cause oriented studies: Some studies try to identify physical, environmental, or educational factors that impede the reading process (see table 1). There seem to be at least two shortcomings in these studies. The first is the uncertainty of the direct causal relationship. The interdisciplinary study of Robinson (1946) revealed that there was a lack of agreement among her group of specialists as to which factor caused the reading problems because there is no theoretical agreement whether these factors are causative, contributory, or merely coincidental to the reading retardation.

   Practical evidence for a direct causal relationship is also lacking. As Merritt (1971 p. 186) points out: "In the case of every factor that is supposed to contribute to reading disability we can find a child who should be at risk who can read perfectly well."

   Another problem is the low and indirect therapeutical value. Having diagnosed etiological factors as brain damage or poor home conditions, the teacher is unable to remove or correct these factors. Furthermore, this approach does not give any direct evidence for specific remedial instruction since the mechanisms operating and the points in the reading process where these factors lead to a disturbance are unknown. "If a child's difficulty with orientation does owe something to a neurological deficit of some kind we certainly cannot operate on his brain. Whatever may have predisposed the child to experience difficulty, the remedial problem consists of developing the appropriate learing sets. This is where more attention is really needed both for practical and theoretical reasons" (Merritt, 1971).

Table 1:

CAUSE ORIENTED STUDIES

PHYSICAL FACTORS:	NIEMEYER	1974	(122 pairs)
	VALTIN	1974	(50 pairs)
ENVIRONMENTAL FACTORS:	EGGERT ET. AL.	1973	(40 pairs)
FAMILY and/or	VALTIN	1974	(100 pairs rsp.
SCHOOL FACTORS			50 pairs)
	ANGERMAIER	1974	(75 pairs)
EMOTIONAL FACTORS:	EGGERT ET AL.	1972	(72 pairs)
	VALTIN	1972	(23 pairs)
	EGGERT ET AL.	1973	(39 pairs)
	NIEMEYER	1974	(122 pairs)
	TREMPLER	1976	
	GUTEZEIT/GARTEN	1976	(20 pairs)
	REUTER	1977	(47 vs. 0)
	BÜTTNER	1981	(116 vs. 0)

2. Deficit oriented studies: These types of studies try to find deficits of reading disabled children in various cognitive functions, such as visual and auditory discrimination, memory, and language (see table 2). Again, there are some shortcomings of this attempt. Researchers usually compare groups of poor and normal readers in these functions, and low achievment of backward readers is interpreted as a deficit that impedes normal progress in reading (compare Angermeier's interpretation, 1974 p. 19). The fallacy of this conclusion is obvious: correlations are interpreted as causal factors, although the design of the studies doesn't permit this.
Moreover, as Reed (1970) and Valtin (1981) have demonstrated, these deficits may be artifacts of the research design and the IQ measure used to define specific reading and spelling difficulty.
Both, the cause oriented approach and these deficit oriented studies, lack an explicit theory of the reading and spelling process that relates the cognitive functions to partial components in the overall process.

Table 2:

D E F I C I T O R I E N T E D S T U D I E S
COGNITIVE DEFICITS

AUTHOR		N	(VISUAL) VISUAL	(VISUAL) MOTOR	VERBAL	AUDITORY	COGNITIVE STYLE	MEMORY	CONCENTRATION	LATERALITY
ARNOLD	78	54 VS. 52	X		X	X				X
DEEGENER	79	25 PAIRS	X					X		
EISENHUT	81	13-20 VS. 29	X					X	X	
ENSSLIN	81	14 VS. 14						X		
KLICPERA	81	33 VS. 19	X					X		
VALTIN	81	93 VS. 200	X		X	X	X	X		
ANWANDER	82	14 VS. 14			X					
VALTIN	72	23 PAIRS			X	X	X	X		
BECKER	73				X	X				
VALTIN	73	100 PAIRS	X	X	X			X	X	X
EGGERT ET AL.	73	72 VS. 48		X		X				X
HANKAMMER	73	30 VS. 30			X					
ANGERMAIER	74	75 PAIRS		X	X	X	X	X	X	X
NIEMEYER	74	122 PAIRS			X	X				X
OEHRLE	75	31 PAIRS	X	X						
BREUER/ WEUFFEN	75	91 VS.274		X		X				
GUTEZEIT/ HEMPEL		35 VS. 60		X						
SCHNEIDER ET AL.		35 PAIRS						X		

3. Symptom oriented studies: These studies try to find characteristics of poor readers and/or spellers in eye movement behaviour (Heller 1978) and in errors in reading and spelling (see table 3).
Since most of these studies lack an explicit or adequate theory of the reading and spelling process, it is difficult to judge the significance of certain error patterns and its usefulness for diagnostic and therapeutic purposes. Only some newer studies try to relate specific errors to partial reading/spelling components (for instance phonetic errors with dialect, Jung 1976, or auditory discrimination, Valtin 1981, or to specific reading strategies, Hofer 1977.

Table 3:

SYMPTOM ORIENTED STUDIES

EYE - MOVEMENTS IN READING:

HELLER 1976 (6 vs. 6)
BAER 1976 (16 vs. 289)

ERRORS IN SPELLING:

VALTIN 1972 (63 vs. 159)
ZINGELER-GUNDLACH ET AL. 1973 (30 pairs)
MÜLLER 1974 (30 vs. 57)
MÜLLER 1974 (86 pairs)
MÜLLER 1974 (101 vs. 101)
JUNG 1976 (46)
RUHFUS 1980 (57 vs. 300)
VALTIN 1981 (70 vs. 164)
EISENHUT 1981 (28)

ERRORS IN READING:

VALTIN 1972 (130 vs. 350)
VALTIN 1974 (100 pairs)
HOFER 1977 (2 vs. 2)
DUMMER 1978 (45 vs. 88)

4. Process oriented studies: This type of study tries to identify partial processes of reading (and/or spelling) in which children with dyslexia are deficient. This approach is represented by the German psychologist Gerheid Scheerer-Neumann. The "main objective is to find an answer to the following question: What is it exactly the reading disabled child does not know? What aspect of reading is disturbed? Or, in the language of the information-processing approach to cognition: What are the elements of component processes of reading which cause problems for the retarded reader which are mastered by his achieving age mate?
If we should succeed in identifying those processes or system components, we could develop remedial programs specifically directed at the deficits" (Scheerer-Neumann, 1981, p. 155).
Scheerer-Neumann has developed a model of word recognition that consists of various partial processes and has demonstrated that poor readers have difficulties with the segmentation of words into economical units. She carried out "two experiments using pseudowords as stimuli, showing that poor readers from third grade were inferior to good readers in the utilization of intraword redundancy and that poor readers' performance with redundant stimuli can be increased when the stimuli are grouped into syllables" (Scheerer-Neumann 1981).

II Studies with explicit educational relevance (intervention studies)

In 1979, the German psychologist Scheerer-Neumann published a book "Interventionen bei Lese-Rechtsschreibschwäche. Überblick über Themen, Methoden und Ergebnisse." This is an exellent review about intervention programs designed for poor readers and spellers and about their topics, methods and results. She has outlined a system for classifying these intervention programs which has been slightly modified for this review (see table 4).

Table 4

STUDIES WITH EXPLICIT EDUCATIONAL VALUE

1. PSYCHOLOGICAL INTERVENTIONS:

TRAINING OF COGNITIVE FUNCTIONS

- VISUAL TRAININGS
- TRAINING OF PHONETIC ANALYSIS; ARTICULATION AND AUDITORY DISCRIMINATION
- TRAINING OF NONVERBAL AUDITORY PERCEPTION
- TRAINING OF CONCENTRATION AND MEMORY
- TRAINING OF REFLEXIVITY (EDLER ET. AL. 1978)

E = 12

PSYCHOMOTOR TRAINING (EGGERT ET AL. 1973)

$E_1 = 24$, $E_2 = 24$, $C = 24$

PSYCHOTHERAPEUTIC APPROACH: NON-DIRECTIVE PLAY-THERAPY (TREMPLER 1976)

$E_1 = 5$, $E_2 = 5$, $E_3 = 9$

- MUSCLE RELAXATION AND AUTOGENES TRAINING (FREY 1977)

E = 24, C = 24

2. SPECIFIC READING AND SPELLING PROGRAMS

PROGRAMS BASED ON PRINCIPLES OF BEHAVIOUR THERAPY

COGNITIVE APPROACHES (REMEDIATION OF DISTURBED PARTIAL PROCESSES)

LINGUISTIC APPROACH (MORPHEME METHOD)

COMPREHENSIVE PROGRAMS

REPORTS ON THE EFFECTIVENESS OF REMEDIAL TRAINING IN SCHOOL

PREVENTION STUDIES

1. Psychological interventions

Based on cause and deficit oriented studies many authors draw consequences for remedial treatment and suggest training programs for the deficient visual, auditory, memory and/or motor functions. The improvement of these functions, so it is believed, will result in an improvement of reading and spelling. Empirical intervention studies are rare, however.
Eggert, Schuck and Wieland (1973) have stated that a psychomotoric training with dyslexia children did not lead to significant differences in comparison with an untrained control group.
Trempler (1976) showed that five dyslexic children who also showed considerable emotional difficulties profited from a non-directive play therapy and reduced their spelling errors. The conclusion of the author that a nondirective play therapy without any spelling training is a useful remedial treatment for all dyslexics is highly questionable because of the limitations of the study (size of the sample, no long-term effects observed).

2. Specific Reading and Spelling Programs

a. Intervention studies based on behaviour modification techniques

There are about 12 studies based on principles of behaviour therapy (small steps, reinforcement, systematic repetition) using a variety of methods: word lists or some kind of audio-visual material. In some instances parents were trained as co-therapists, (see table 5).

Some of the programs seem to be quite effective. But it is impossible to draw any conclusions about the relative efficacy of these intervention programs since the sample characteristics and the training procedures are not comparable. Furthermore, it is not clear which program factor was effective: the systematic reinforcement procedures, or the specific way of spelling and reading training (writing of words after dictation, writing of words after their tachistoscopic representation) or another factor (f.i. increased attention paid to the child) or a combination of all of them. Most of the studies do not answer the question whether a behaviour modification program has a differential effect on trained and untrained words (whether it is only effective for trained words or whether it has a transfer effect on untrained words also).
In nearly all studies only group comparisons are made. It seems also advisable to use a statistical procedure for testing the significance of change on the individual level. In the Schneider/Springer study (1978) 10 out of 14 experimental children and 5 out of 14 children of the control group showed a significant improvement in spelling.
Inspection of the data presented by Reuter/Köhler (1981) reveals, that the program (parents as co-therapists) was not effective for about 20 % of the subjects, tested about 19 months after the training. Additional information is needed about the factors that impede the efficacy of these programs.

Table 5:

T R A I N I N G S B A S E D O N B E H A V I O U R M O D I F I C A T I O N

AUTHORS	TRANING GROUPS		N	DURATION	ERROR REDUCTION SPELLING RESULTS (E. R.)
MACHEMER '73	E	PARENTS AS THERAPISTS	14	4 1/2 MONTH: 35 H.	88 ⟶ 98
	C_1	REMEDIAL TRAINING IN SCHOOL	11	21 42 H.	85 ⟶ 88
	C_2	NO TRAINING	25	-	87 ⟶ 88
TAUSCH '74 ET AL.	E_1	CASSETTE RECORDER IMMEDIATE FEEDBACK	25	15 DAYS	E.R. 53 %
	E_2	LATER FEEDBACK	30	15 DAYS	49 %
	C_1	COPYING OF WORDS	30	15 DAYS	$E_1 + E_2 > C_1$
	C_2	NO TRAINING	86		
PONGRATZ/ GUTEZEIT '76	E_1	TACHISTOSCOPE	83	8 WEEKS (45 X 15 MIN.)	9.9
	C	REMEDIAL EDUCATION IN SCHOOL	59	8 WEEKS (8 X 45 MIN.)	5.1 (REDUCTION OF ANXIETY)
GUTEZEIT/ PONGRATZ '75	E_1	TACHISTOSCOPE	10	8 WEEKS (3 x 15 MIN.)	10
	E_2	" WITH TOKEN	10		6
	C_2	CONVENTIONAL (MAINLY PHONETIC ERROR REDUCTION)	10		-3
GUTEZEIT/ MEIER '77	E_1	TACHISTOSCOPE (SMALL GROUP)	18	8 WEEKS (3 x 15 MIN.)	$E_1 > C$
	C	CONVENTIONAL	18	10 WEEKS (1 x 45 MIN.)	SPELLING + READING NO ANXIETY RED.
SELG '78	E_1	TT (TALKING TYPEWRITER)			

		INDIVIDUAL TRAINING	14	6 MONTHS (55 x 30 MIN.)	T-DIFFERENCES 11.75
	E_2	TRADITIONAL SPELLING PROGRAM (GROUP)	6	6 MONTHS (55 x 30 MIN.)	10.80
	E_3	TRADITIONAL SPELLING TRAINING (INDIVIDUAL)	20	6 MONTHS (55 x 30 MIN.)	11.60
	C	NO TRAINING	26		9.33 (VERY SMALL LONG TERM EFFECTS)
BRUCHHOLD '78	E_1	AUDIO-VISUAL	8	24 H. à 40 MIN.	$E_1 + E_2 > C$
	E_2	TRADITIONAL SPELLING	8	dto.	
	C	NO TRAINING			
					E.R.
	E_1	3RD GRADE	8	8 WEEKS (15 H.)	12
	E_2	4TH GRADE	7	dto.	25
SCHNEIDER/ SPRINGER '78	E_1	INDIVIDUALIZED INSTRUCTION + TOKEN	14	5 MONTHS (72 H.)	11.8
	C	-	14		3.1
SCHLESINGER '78	E	DICTATION OF WORDS WITH REINFORCEMENT	44	40 SESSIONS	PR 12 ⟶ 41
	C	-	-		
IMMISCH '78	E_1	DICTATION OF WORDS + TOKEN (3 GROUPS à 4)	12	90 MINUTES	REDUCTION OF ERROR VARIABILITY
	E_2	(3 GROUPS à 4)	12	90 MINUTES	
REUTER '77	E	PARENTS CO-THERAPISTS (RESPONSE-COST)	69	4 MONTHS 40-88 DAYS (21 H.)	E.R. SPELLING: 32 % READING: 54 % READING TIME: 18 %
	C	-			
REUTER/ KÖHLER '81					19 MONTHS LATER: 70--- 53--- 31 ERROR REDUCTION (20 % NO IMPROVEMENT)

b. Cognitive approaches

The East German Kossow has developed and evaluated the most comprehensive spelling program for poor spellers. The program is based on the Soviet learning theory (with emphasis on the conscious activity of the learner and the supposition that learning of cognitive processes is an interiorization of an outer activity) and on specific assumptions about the nature of reading and spelling disabilities.

Kossow supposes that in poor spellers mainly the auditory and articulatory processes are disturbed but he also stresses the importance of etymological and grammatical aspects of the language. His training uses a very systematical approach beginning with the learning of letters and sounds (the child also acquires knowledge about the articualatory features of sounds and in some instances learns hand symbols for sounds), then the learning of words with phonetic spellings and then words with nonphonetic spellings.

The conscious activity and the awareness of certain processes is stressed. The children f.i. learn algorithms that give schematic hints for the spelling of words, f.i. algorithms how to decide whether a word begins with a majuscule or how to differentiate certain sounds by watching the articulatory features (b-d, g-k).

The program consists of a series of systematically differentiated types of exercises, like:

- segmentation of words into syllables and phonemes
- morphological and grammatical exercises (f.i. how to derive a spelling pattern by using the plural (Hand-Hände)
- with the aid of visual symbols for certain spelling difficulties the child supports the memorizing for words with non-phonetic spellings.

Table 6:

COGNITIVE TRAININGS: TRAINING OF PARTIAL PROCESSES

		TRAINING GROUPS		N	DURATION	RESULTS
						ERROR REDUCTION
KOSSOW		E_1	4 CLASSES	51	1 YEAR (200 H)	75 %
		E_2	CLINIC: GROUPS	11	3-4 MONTHS, 60 MIN. DAILY	86 %
		E_3	CLINIC: INDIVIDUALIZED PROGRAM	8	60 MIN. DAILY	93 %
						ALSO LONG TERM EFFECTS
SCHEERER-NEUMANN	1981	E	(GROUPS OF 2 AND 3) SYLLABLE SEGMENTATION	15	12 SESSIONS à 30-45 MIN.	ERRORS IN READING TEST 24 ⟶ 15
		C		15		26 ⟶ 28
SCHEERER-NEUMANN	1979	E_1	SPELLING TRAINING + VERBAL SELFINSTRUCTION + SYMBOLS FOR OPERATIONS	12	9 WEEKS 18 SESSIONS à 25 MIN.	ERROR REDUCTION 40 %
		E_2	VERBAL SELF-INSTRUCTION TRAINING WITH NON VERBAL MATERIAL + TRAINING AS E_1	12	18 SESSIONS (12 + 18)	30 %
		E_3	SPELLING TRAINING	12	18 SESSIONS	34 %
		C	NO TRAINING	12	---	19 %

As can be seen from the table 6, the program was quite effective. The overall reduction of errors was considerable, especially for the clinic group that received individualized training based on a diagnosis of the spelling errors. The error reduction in all groups was greater in the trained categories than in the untrained categories. The long term effects were also promissing. The children improved their grades in spelling and reading on the average about 1.5. The limitations of the study lie in the unclear diagnosis of the poor spellers (on the basis of school grades, no tests were used) and the lack of a control group. But the data suggest that an individual program based on specific error patterns in spelling (experimental group 3) is more effective than the overall program.

Scheerer-Neumann (1979) has used parts of the Kossow-program: segmentation into syllables, majuscules, consonants (b-d, d-t, g-k) in the beginning, at the end and in the middle of a word, and sp, st, in her experimental group 3.
Group 1 received this spelling program together with a verbal self-instruction training and learned to use visual symbols for certain operations to be carried out (symbols for "clear articulation", reflection whether the word begins with a majuscule, syllabication etc.). Experimental group 2 received the same training as group 3 after a six-week verbal self-instruction training with figural (non-verbal) material. As can be seen from table 6, all 3 experimental groups did reduce their errors in reading. The error reduction was also observed in words that comprised the same trained categories but not in categories that were not trained in the program. Scheerer-Neumann concludes that a spelling program for remedial education is only effective if the partial processes that are not yet fully master-

ed by the child are trained directly and that no transfer is to be expected from trained to untrained error categories or from one trained component to another untrained component of spelling.

Scheerer-Neumann (1981) also developed a reading program for third grade children with emphasis on syllable segmentation without neglecting the morpheme principle, however. The training procedure was as follows: the children first had to segment words orally that were read to them; a second step was to relate the articulatory segments of a word to their visual equivalents. The very thorough analysis of syllables and their boundaries should make the children aware of the structure of syllables and of the syllabic structure of words. The theoretical considerations of this program are the following, as expressed by Scheerer-Neumann (1981): "Our experiments had shown that poor readers are not only deficient in structuring word-like stimuli, but that they apparently do not even apperceive the whole stimulus at the stage of visual processing; they seem to stick to the first few letters instead. In order to counteract this tendency we asked the children in several exercises first to find out the vowels of a written word - so to speak as the psychological centers of the syllables - and then to mark the syllable boundaries. This was followed by first reading the word 'in syllables' and then 'as a whole'."
The study comprised 15 poor readers, the control group was matched in regard to age, sex and IQ. The Ss in the control group underwent the same training procedure after the first study had been completed.
The children were trained in their schools, in groups of two or three in two sessions a week (30 or 45 minutes), 12 sessions altogether.

The training program included the following elements:

- segmentation of spoken words, training of difficult grapheme-phoneme-correspondence, introduction of the differences between vowels and consonants. Finding the vowels (tracing them in color) and marking syllable boundaries in written words.
- Syllable segmentation of written words.
- Reading of short sentences (words are first analyzed as above).
- Training in common prefixes and suffixes.

The success of the program was tested in three ways:

- overall reduction of errors in a reading test administered before and after the training
- reduction in those errors that should have been specifically reduced by the program
- a final step of analysis was a laboratory experiment investigating changes in that particular component process that was to be established by the program, that is the utilization of intraword structure.

Indeed significant differences in favour of the experimental group were found in all three of these measures.

c. Linguistic approach

The "Legastenie-Zentrum", Berlin, is an institution where children with severe reading and writing problems (in most cases together with behavioural difficulties) receive a special remedial training called morpheme-method (twice a week in the afternoon, 5 or 6 children meet in groups with 2 psychologists as therapists). "Legastenie" is viewed as a symptom of a more general disturbance in the emotional development. This program stresses two aspects: insight in the important role of written language in our society and the learning of morphemes as an economical approach. After having internalized the letters of the alphabet, the children learn the 200 most common morphemes and after that read short texts based on morphemes. Even though this center exists since 1970 and up to now many hundreds of children have received remedial training, the information about the efficacy of this approach is unsatisfying. The only reports concern a sample of 19 (Pilz 1976) and 41 (Greve 1979): most of these children were later successful in school but only after a long training period (1,6 to 4,6 years).

d. Comprehensive training programs

Breuninger (1980) and Betz/Breuninger (1982) have developed and evaluated a comprehensive remedial program for dyslexic children in sixth grade (about age 13). The program consists of 3 parts:

- individual remedial education given by university students that were especially trained. (This remedial education takes place in the home of the child once a week and consists of individualized instructions (based on the error patterns) together with systematic reinforcement and a verbal selfinstruction training.)
- group therapy by psychologists with the aim that the dyslexic children become able to cope with anxiety inducing situations and to improve their self-concept
- small group training of parents once a week (8 evenings). Psychologists give information about the nature of dyslexia and try to improve the understanding of the parents for their children and to alter their attitude and reinforcement behaviour towards their children.

In a first study with 43 dyslexic children (Breuninger 1980) all parts of the program resulted in a significant error reduction in spelling (see table 7). On the basis of this study and their experiences the authors suggest the following procedure: compulsory parent-training to create a favorable home climate is followed by an individual spelling training. If this training does not show a clear error reduction after 3 weeks, the child joins a group therapy class for coping with anxiety and improving her or his self- confidence. 17 children participated in this new program and were able to reduce their errors about 40 % after 8 weeks of training. The error reduction was higher for the

Table 7:

COMPREHENSIVE TRAINING PROGRAMS

BREUNINGER 1980

GROUPS + TRAINING	DURATION	N	ERROR REDUCTION
E_1 (SPELLING + SELF CONFIDENCE)	8 WEEKS	12	
E_2 (SPELLING)	ONCE A WEEK	12	26 - 33 %
E_3 (SELF-CONFIDENCE)		12	
C	-	7	- 11 %
GROUPS WITH PARENTS TRAINING		24	29 %
GROUPS WITHOUT PARENTS TRAINING		12	21 %

BREUNINGER 1980

GROUPS + TRAINING	DURATION	N	ERROR REDUCTION
E_1 PARENTS TRAINING + SPELLING	8 WEEKS	12	36 %
E_2 PARENTS TRAINING + SPELLING + SELF-CONFIDENCE	8 WEEKS	5	49 %

children who had participated in group-therapy. In this study the error reduction of the dyslexic children showed a clear relation to qualification involvement and enthusiasm of the university student who performed the individual spelling training.

e. Reports about the effectiveness of conventional remedial education

Some studies do not seek empirical verification of the effectiveness of certain theoretically based procedures but investigate the effectiveness of more traditional remedial education programs.

Atzesberger/Frey (1977) report about a reading and spelling program that was carried out with third and fourth graders (5 groups with 7 children and 9 groups with 4 children). The program lasted for two years with 3 lessons a week. The children improved their spelling (from PR 8 to PR 21), their reading time (from PR 6 to PR 12) and their reading errors (from PR 4 to PR 50). The group size had no effect on reading but on spelling (better effects for small groups of 4 children).

About 30 % of the children improved considerably after this two-year program (PR > 40 in at least 2 of the 3 measures), but one third still had difficulties in reading and spelling (PR < 40).

The authors tried to isolate factors that foster or impede the efficacy of remedial training. They observed that children with low IQ (87-109) profited more from the training then children with higher IQ (> 109) - the difference was significant for reading accuracy. Children from lower social classes improved significantly in reading accuracy.

Children with and without birth disorders and language disorders did not differ in their progress in reading and spelling. Children with more than 6 factors of pre-, peri- and postnatal developmental disorders showed significantly lesser gain in reading rate.

Six months after the beginning of the training parents were asked in a written interview about changes in the behaviour of their children. 65 % of the parents reported an improvement, 10 % a negative result ("nervousness"). The authors suggest that about 15 % of the dys-

lexic children need additional behaviour modification therapy. Other reports on the long term effectiveness of remedial group training in reading and spelling in school also indicate that some children still lack behind or even show comparatively lower performance in standardized tests.

Rathenow/Vöge, 1982, report that 5 out of 29 children after one year of remedial training had poorer performance in spelling. They cite a study of Wehowski (1976) who compared 10 dyslexic children with 2 years remedial teaching and 89 dyslexic without remedial training. 62 % of the remedial group and 55 % of the control group showed improvements, 27 % of the remedial group and 28 % of the control group had poorer performance one year later. Dyslexic children from higher social classes profited more from the remedial training than children from lower social classes. Boys from lower social classes did not profit much from remedial training - truancy was one reason for it.

Another report of the effectiveness of remedial education has been published by Büttner (1981). It is based on data of children with reading and spelling difficulties who were diagnosed as "dyslexic" by psychologists working at a child psychiatry hospital in Schleswig. One to three years after this diagnosis the parents of 194 children were asked to participate in a written interview about the progress of their children. The answers of 116 parents (62 %) indicated that 30 % of the children showed clear improvements in their spelling, 50 % a slight improvement and 20 % no improvement. Children with no improvement had significantly more emotional problems, more psychic disturbances (lack of concentration and motivation) and also difficulties in other school subjects but they did not differ from the children with clear improvements in regard to the degree of their reading and spelling disability. No data are given with respect to the IQ, unfortunately. Interestingly there were no differen-

ces between the 2 groups with clear and with no improvement in the type of remedial education that had been given (whether they had remedial education in school, by private institutions or by their parents).
Part of this sample was again questioned 5 years later, that is 5 to 7 years after the dyslexia had been diagnosed. The answers of 55 parents (65 % of the sample) indicate that 80 % of the children had overcome their problems and that 20 % showed slight improvements - this result was again independent of the nature of the remedial training (in the school, private or by parents).
To summarize, 1 to 3 years after the dyslexia had been diagnosed, 30 % of the children in the Büttner study showed a clear improvement and 5 to 7 years later, 80 % showed a clear improvement. The author concludes from these data that dyslexic children profit from any kind of remedial education and that the most important thing is, that something is done. The limitations of this study, however (smallness of the sample, heavy selection effects, probably unreliable data that are based on statements of the parents) are too severe as to justify these conclusions. An interesting finding of this study is that dyslexic children with no severe emotional problems seem to profit better from remedial education.

f. Prevention studies

In addition to those studies where children with already apparent reading and spelling problems are trained there are reports on some prevention studies who seek to reduce the incidence of reading and spelling failures through improved teaching instructions in first grade (s. table 8).
In Grissemann's study (1981) children of the experimental classes were taught with an analytic-synthetic approach that was characterized by a specific training of partial processes of reading, systematic exercises and repetition and remedial procedures for children with difficulties.
In Radigk's study (1978) the children of the experimental classes received an instruction in reading and spelling that was characterized by a general fostering of language activities, individualized programs, use of audio-visual materials (children used tape-recorders and headphones in a sort of language laboratory). Children with special difficulties received remedial education for two hours a week by a specially trained teacher. At the end of first grade the incidence of reading respectively spelling failures was reduced in both studies. In Radigk's study children of all intelligence levels profited from the program, the highest improvement in reading, however, was achieved by children with average intelligence, followed by children with low intelligence (IQ < 90).
Blumenstock (1979) used a training program in articulation, auditory discrimination, sound analysis and sound synthesis partly in connection with single letters. After 32 training sessions the achievement of the experimental group was significantly better in most of the trained areas (excluding articulation and auditory discrimination) and also in the reading and spelling of letters and of trained and untrained words.
From the basis of these studies, it may be concluded that an improved reading instruction together with immediately beginning remedial procedures for children with difficul-

ties - in the sense of the mastery learning approach - may reduce the incidence of failures in reading and spelling to a considerable degree.

Table 8:

P R E V E N T I O N S T U D I E S

AUTHOR		GROUP	N	DURATION	RESULTS
RADIGK	78	E (8 CLASSES) (DIFFERENTIATED PROGRAMS, AUDIO-VISUAL MATERIALS REMEDIAL EDUCATION 2 H a WEEK fOR POOR READERS)	233	1 YEAR	SPELLING PR < 15 4 %
		C (3 CLASSES)	84		32 %
BLUMEN-STOCK	79	E (3 GROUPS) (TRAINING IN ARTICULATION, AUDITORY DISCRIMINATION, SOUND ANALYSIS + SYNTHESIS)	39	5 MONTHS	SIGN. DIFFERENCES IN SOUND ANALYSIS + SYNTHESIS, READING AND SPELLING OF LETTERS AND WORDS (TRAINED AND UNTRAINED)
		C	39	32 SESSIONS	
GRISSEMANN	81	E (NORMAL CLASSES, IMPROVED READING METHOD WITH SYSTEMATIC EXERCISES AND REMEDIAL PROCEDURES FOR POOR READERS	542	1 YEAR	READING PR < 1: 0 ; 1 - 10: 3,5 ; 11 - 25: 11
		C	655		13 ; 14 ; 23

Conclusions:

At the end of my paper I will try to draw two kinds of conclusions, first with regard to remedial and therapeutical procedures and second with regard to further research.

First: Consequences for remedial education

Based on this review of empirical studies it is very difficult to draw any decisive conclusions about specific intervention procedures because the studies are not comparable in respect to:

- definition of dyslexia (the groups vary in respect to the degree of the retardation in reading and/or spelling and the level of IQ)
- criteria used for evaluation of the success of a program (significant error reduction in self-made informal tests, standardized tests; only a few studies investigate whether the anxiety and the neuroticism of the subjects has decreased, nearly no study reports if the subjects were better motivated and had more fun with reading and spelling as effect of the training)
- length of the training:
  In most studies only the mean error reduction of the group is reported and no information is given whether the program was equally effective for all children or only for part of the children.

The only decisive conclusions we may draw are the following:

1. The training effect is independent to the IQ of the children. In the past, in some states of the Federal Republic of Germany, reading and spelling disabled children below a certain IQ level (generally below 90 or 95) were excluded from specific remedial educa-

tion. The present data do not justify this procedure. Fortunately, a new school law prescribes that children of all intelligence levels should receive remedial education in school if they have difficulties in reading and spelling. By the way, this federal law forbids the use of the term "dyslexia", because of its many incompatible connotations which may create misleading assumptions, and to use the neutral term "reading and spelling difficulties".

2. An improved instruction of reading in the first year of school and immediate remedial procedures for children with difficulties lead to a reduction of cases of reading and spelling disabilities.

3. Despite of the existence of two years of remedial education in the elementary school (dyslexic children normally receive small group remedial training during third and fourth grade) about 20 to 30 % of these children still have severe spelling problems (the problems in reading tend to be overcome earlier). Factors that impede a normal progress in these children seem to be: emotional and behavioural problems (Atzesberger/Frey, 1977; Büttner, 1981), lack of motivation and concentration (Büttner 1981) and multiple developmental disorders (Atzesberger/Frey, 1977).

4. Many children are able to overcome their dyslexia through specific instruction in reading and spelling and without psychotherapeutic interventions.

5. We still lack broad empirical evidence but it seems reasonable to conclude that programs who are specifically designed to meet individual needs and difficulties of the students are more effective than comprehensive programs that work with a watering-can principle (everything for everybody) as Kossow has demonstrated.

Second: Conclusions with regard to research

In her excellent review on intervention studies with dyslexic children Scheerer-Neumann (1978) makes two recommandations for future research which are still valid:

- Most researchers seem to be content with the finding that a program has led to a significant change. But the demonstration that a specific program has led to a significant error reduction is not sufficient since nearly all programs of all kinds bring about a short-dated error reduction. The efficacy of a program can only be demonstrated if the subjects reach a predetermined learning goal and if it has a long-term effect.
- The fact that a program leads to an improvement in spelling and reading is not necessarily a proof for the validity of the theory upon which the program is based because other factors may be responsible for the progress (f.i. Hawthorne-effect, the increased attention paid to the subject, or emotional support). In order to proof the efficacy of a specific training procedure it is necessary not only to measure the reading and/or spelling improvement but also to measure directly the components or functions that should be trained and that are supposed to lead to an improvement of reading and spelling. The Scheerer-Neumann study (1981) is an example of this kind.
- In addition to these recommandations it seems useful for further studies not only to look on group changes but also to consider the significance of change on the individual level and to try to indentify factors that impede the program efficacy.

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